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09/870,957	05/30/2001	Tomoki Kobayashi	IIW-003	9126

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EXAMINER

CREPEAU, JONATHAN

ART UNIT PAPER NUMBER

1746

DATE MAILED: 01/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/870,957

Applicant(s)

KOBAYASHI ET AL.

Examiner

Jonathan S. Crepeau

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 September 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30,32,33,36 and 37 is/are rejected.
- 7) ☒ Claim(s) 31,34 and 35 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) Z.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. This Office action addresses claims 1-19 and newly added claims 20-37. Claims 1-30, 32, 33, 36, and 37 are newly and variously rejected under 35 USC §102 and §103, but these rejections were not necessitated by amendment. Claims 23-25 are rejected under 35 USC 112, first paragraph. The previous rejections under 35 USC §112, second paragraph are withdrawn. Claims 31, 34, and 35 are objected to as containing allowable subject matter. Accordingly, this action is non-final.

Claim Suggestions

2. Claim 35 appears as if it should depend on claim 34 because it has proper antecedent basis therein. Claim 35 will hereafter be interpreted as depending on claim 34.

Claim Objections

3. Claims 11 and 13 are objected to because of the following informalities: in claim 11, line 3, "controlling for controlling" should be "controller for controlling"; in claim 13, line 8, "the all of the exhaust gas" should be "all of the exhaust gas." Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 23-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 23 recites that action is taken when the “temperature of the fuel cell” is below a predetermined level. There is not believed to be adequate support for this terminology in the application as originally filed. The application provides support for a variety of temperature measurements, but they all concern inlet or outlet reactant streams (T1-T3 in the Figures). There is no disclosure of a temperature measurement of the fuel cell *per se* or a temperature measurement of any part within the actual fuel cell. Accordingly, the language “temperature of the fuel cell” is believed to constitute new matter into the application.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 3, and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by Strasser (U.S. Patent 5,543,238). Regarding claims 1 and 37, the reference is directed to an apparatus comprising a fuel cell (2) (see Fig. 1). Supply gas (26) is supplied to the fuel cell and exhaust gas (2) is discharged therefrom. The apparatus comprises means for returning the exhaust gas to the supply gas (i.e., adjusting element 30; see col. 5, line 18). The adjusting element is controlled responsive to the "warming-up" conditions (i.e., the power output) of the fuel cell (see col. 5, line 19). Regarding claims 3 and 37, the apparatus comprises a compressor (36) which discharges the exhaust gas and returns it to the supply gas. Regarding claim 37, the reference is anticipatory of a method for "starting" a fuel cell because the disclosed method encompasses all operating times, i.e., also during startup. The compressor would inherently heat the gas adiabatically, as recited in claim 37. The apparatus is thus capable of warming up the fuel cell, as recited in claim 1.

Thus, the instant claims are anticipated.

8. Claims 1, 2, 23, and 26-28 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 58-164157. Regarding claims 1, 23, 26, and 27, the reference is directed to an apparatus

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comprising a fuel cell (2) (see Fig. 2). Supply gas (7) is supplied to the fuel cell and exhaust gas (8) is discharged therefrom. The apparatus comprises means for returning the exhaust gas to the supply gas (i.e., valve 11; see abstract). Regarding claims 2, 23, 26, 27, and 28, the valve is controlled by a controller (13) responsive to the exhaust gas temperature (12). Regarding claim 1, this exhaust gas temperature corresponds to a "warming-up condition" of the fuel cell. Regarding claim 26, the valve may also be controlled in response to the inlet temperature of the air (see abstract).

Thus, the instant claims are anticipated.

9. Claims 1, 11, 12, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 62-219472. Regarding claim 1, the reference is directed to an apparatus comprising a fuel cell (11) (see Fig. 1). Supply gas (19B) is supplied to the fuel cell and exhaust gas (18) is discharged therefrom. Regarding claims 1 and 20, the apparatus comprises means for returning the exhaust gas to the supply gas (i.e., three-way valve 27B; see abstract). Regarding claims 1, 11, and 12, the valve is controlled responsive to the power output of the cell, which corresponds to the oxygen content in the supply stream (see abstract). Regarding claim 1, the power output corresponds to a "warming-up condition" of the fuel cell.

Thus, the instant claims are anticipated.

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10. Claims 1, 3, 13, 15, 20, 22-25, and 37 are rejected under 35 U.S.C. 102(e) as being anticipated by JP 2000-195533. Regarding claim 1, the reference is directed to an apparatus comprising a fuel cell (1) (see Fig. 1). Supply gas (41) is supplied to the fuel cell and exhaust gas (42) is discharged therefrom. Regarding claims 1 and 20, the apparatus comprises means for returning the exhaust gas to the supply gas (i.e., three-way valve 6; see abstract). Regarding claims 1 and 23-25, the valve is controlled responsive to inlet temperature (8) of the oxidant stream (see abstract). Regarding claim 1, the inlet temperature is warming-up condition of the fuel cell. Regarding claims 13 and 37, a compressor (5) supplies the exhaust gas to the supply gas. Regarding claims 13, 24, and 25, all of the exhaust gas is returned via channel 65 during the warm-up period (see abstract; paragraph 21 of the machine translation). Regarding claim 15, a controller (9) determines whether warming-up has been completed (see abstract). Regarding claim 22, the apparatus comprises a humidifier (73).

Thus, the instant claims are anticipated.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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12. Claims 3-10, 13, 15, 17, 19, 24, 25, 32, 33, 36, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 58-164157 in view of Strasser.

JP '157 is applied for the reasons stated above. Furthermore, regarding claims 5 and 6, the valve (11) would also function to control the pressure of the fuel cell exhaust gas. Regarding claims 7-10 and 33, the valve may also be controlled in response to the inlet temperature of the air (see abstract).

While Figure 2 of JP '157 teaches element 10 in the air recirculation line (and element 7 in the air intake line), the abstract of JP '157 does not expressly disclose that element 10 is a compressor, as recited in claims 3, 4, 13, 32, and 37.

Strasser is directed to a fuel cell recirculation system, as set forth above. The air intake and recirculation lines contain compressors (26, 36). Regarding claim 19, the ratio of fresh air to recycled air is adjusted to maintain a specific oxygen level at the cathode-side supply (see col. 5, line 32 et seq.)

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use compressors as elements 7 and 10 of JP '157. Pressurized reactants are known to be beneficial to fuel cell performance. See Strasser at col. 4, line 41 ("the static air pressure being approximately 1.3-4 bar in the exemplary embodiment"). Thus, the artisan would be motivated to use compressors as elements 7 and 10 of JP '157. Such compressors would also function adiabatically and raise the temperature of the gas, as recited in claim 37. Regarding claim 19, which recites that fresh air is taken to replenish oxygen during power generation, this would be

an obvious manner of operating the system of JP '157, as shown by Strasser. When the load becomes high or the oxygen concentration to the fuel cell is decreased, it would be obvious to supply more fresh air to the fuel cell, which has a higher concentration of oxygen than the recycled air.

Regarding the recitation in claims 13, 24, 25, and 36 that all of the exhaust gas is returned to the compressor (or supply gas) during a warming-up (starting up) period, this limitation would be rendered obvious by the disclosure of JP '157. The purpose of the invention of JP '157 is to keep the outlet temperature of air within predefined limits. Upon starting the fuel cell, it would be obvious to recirculate all the hotter exhaust air and mix it with the incoming cooler air until the temperature of the exhaust air is stabilized. Furthermore, regarding claims 15 and 17, the controller would "know" when warming-up has finished because the temperature would reach a predefined lower limit. At that point, the controller would temporarily stop the recirculation, as recited in claim 24. Accordingly, the subject matter of claims 13, 15, 17, 24, 25, and 36 would be rendered obvious to a skilled artisan.

13. Claims 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 62-219472 in view of JP 58-164157.

JP '472 is applied to claims 1, 11, 12, and 20 for the reasons stated above. Regarding claim 29, the reference discloses a three-way valve (27B) in an air recirculation line.

JP '472 does not expressly teach that the temperature of the exhaust gas is measured and the three-way valve is adjusted so as to return the exhaust gas to the supply gas when the temperature is below a predetermined level, as recited in claim 27.

As noted above, JP '157 is directed to a fuel cell system comprising an outlet gas temperature sensor (12) and a means for returning the exhaust gas depending on the temperature.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the temperature sensor and associated control scheme of JP '157 in the system of JP '472. In the abstract, JP '157 teaches that the purpose of the invention is "to maintain at a proper temperature automatically and to require no special control equipment or auxiliary equipment." Thus, the artisan would be motivated to apply the control scheme of JP '157 to the system of JP '472, thereby rendering the claimed subject matter obvious.

14. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Strasser in view of Voss et al (U.S. Patent 6,106,964).

Strasser is applied to claims 1, 3, and 37 for the reasons stated above.

However, Strasser does not expressly teach the presence of a heat exchanger and a humidifier which function to exchange heat and humidity between the supply and exhaust gas, as recited in claims 21 and 22.

Voss et al. is directed to a fuel cell system comprising a combined heat and humidity exchanger ("CHHE") which exchanges heat and humidity between a reactant supply and exhaust stream (see abstract; Figure 2).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the CHHE of Voss et al. in the system of Strasser. In column 3, line 55, Voss et al. teach that, in reference to their invention, "a simpler and more energy efficient means for pre-heating and humidifying reactant supply streams in a solid polymer fuel cell systems is desirable." Accordingly, this teaching would motivate the artisan to use the CHHE of Voss et al. in the system of Strasser, thereby rendering the claimed subject matter obvious.

15. Claims 14, 16, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2000-195533 in view of Voss et al.

JP '533 is applied to claims 1, 3, 13, 15, 20, 23-25, and 37 for the reasons stated above.

However, JP '533 does not expressly teach the presence of a heat exchanger which exchanges heat between the supply and exhaust gas, as recited in claims 14 and 21.

Voss et al. is directed to a fuel cell system comprising a combined heat and humidity exchanger ("CHHE") which exchanges heat and humidity between a reactant supply and exhaust stream (see abstract; Figure 2).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to replace the humidifier of JP '533 with the CHHE of Voss et al. In column 3, line 55, Voss et al. teach that, in reference to their invention, "a simpler and more energy efficient means for pre-heating and humidifying reactant supply streams in a solid polymer fuel cell systems is desirable." Accordingly, this teaching would motivate the artisan to use the CHHE of Voss et al. in the system of JP '533, thereby rendering the claimed subject matter obvious.

16. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2000-195533 in view of Voss et al. as applied to claims 14, 16, and 21 above, and further in view of JP 58-164157.

JP 2000-195533 does not expressly teach that the controller determines the completion of warming-up on the basis of the gas exhaust temperature.

As set forth above, JP 58-164157 is directed to a system comprising a controller responsive to an exhaust gas temperature.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the exhaust temperature sensor of JP '157 in the system of JP '533 in order to verify the completion of the warm-up period. In the abstract, JP '157 teaches that both an inlet and outlet sensor are advantageous for controlling the operating temperature of the fuel cell. Thus, the outlet sensor is

disclosed as being a functional equivalent of the inlet sensor. Accordingly, the artisan would be sufficiently skilled to use an outlet sensor in place of, or in addition to, an inlet sensor in the system of JP '533. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06.

17. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 58-164157. JP '157 is applied to claims 1, 2, 23, and 26-28 for the reasons stated above.

However, the reference does not expressly teach the steps of measuring the temperature of the supply gas when the temperature of the exhaust gas is lower than a predetermined level, as recited in claim 30.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use a control scheme in JP '157 wherein both the supply and exhaust temperatures are measured until both measurements are above threshold values. During startup, such a control scheme would ensure the complete warming up of the system. Accordingly, the claimed step of measuring the temperature of the supply gas when the temperature of the exhaust gas is lower than a predetermined level is considered to be obvious to a skilled artisan.

Response to Arguments

18. Applicant's arguments filed September 30, 2003 have been fully considered but they are not persuasive insofar as they apply to the present rejections. Regarding the Strasser reference, Applicants state that the reference is concerned with the actual operation of the fuel cell, i.e., when the fuel cell is producing power, and that this does not constitute a "warming-up period" of the fuel cell. However, it is noted that the fuel cell may warm up *while* it is operating. It is submitted that a "warming-up period" is not limited to the period before power generation is begun. Furthermore, claim 1 merely recites "An apparatus for warming-up a fuel cell...". As the "warming-up" limitation is recited functionally, the apparatus of Strasser is capable of warming up the fuel cell, and therefore meets the claim.

Applicants further state that Strasser does not teach or suggest whether to recirculate all or none of the exhaust gas based on conditions in the fuel cell. However, the language of claim 1 does not in fact require "all or none" of the gas to be recirculated. The claim merely requires "means for returning an exhaust gas." This language is considered to invoke 35 USC §112, sixth paragraph. Therefore, prior art elements that are equivalents of the corresponding elements in the specification are sufficient to meet the claim limitation. See MPEP §2183. In this case, the "adjusting element" of Strasser performs the identical function specified in the claim in substantially the same way, and produces substantially the same results as the corresponding element disclosed in the specification. Accordingly, claim 1 is still considered to be anticipated by the Strasser reference.

Allowable Subject Matter

19. Claims 31, 34, and 35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

20. The following is a statement of reasons for the indication of allowable subject matter:

Claims 31 and 34 recite a method which comprises, among other steps, the steps of decreasing an opening in a pressure control valve in response to a low temperature measurement of a supply gas, or increasing the opening in response to a high temperature measurement. The closest prior art, JP 58-164157, teaches inlet and outlet temperature sensors, but does not fairly suggest increasing or decreasing an opening in a pressure control valve in the claimed manner. In contrast, the opening of the valve 11 appears to be *increased* when the temperatures are below a threshold value (in order to recirculate more hot gas). This is the opposite of the claimed configuration. Accordingly, claims 31, 34, and 35 contain allowable subject matter.

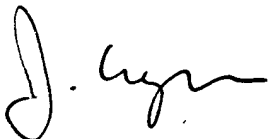
Conclusion

21. Full translations of JP 58-164157 and JP 62-219472 have been ordered and should be available about 30 days after the mailing of this communication. If Applicants should need the translations in preparing a response to this Office action, they are requested to contact the Examiner by telephone.

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22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (571) 272-1302. The phone number for the organization where this application or proceeding is assigned is (703) 305-5900. Additionally, documents may be faxed to (703) 872-9310 (for non-final communications) or (703) 872-9311 (for after-final communications).



Jonathan Crepeau
Patent Examiner
Art Unit 1746
December 23, 2003